

MARCH • 1981

FARM CHEMICALS

9/30/81 CS 120-1



STATISTICAL REF INDEX
4520 E-W HWY 512 600
WASHINGTON DC * 20014
P 0110584 60

Dr. Dale Wolf
Explains the New Chemistry
at DuPont Agrichemicals

BEST AVAILABLE COPY

Richard T. Meister
President and Editorial Director

Gordon L. Berg
Editor

Charlotte Sine
Managing Editor

Sophie Meister
Associate Editor

Shirley I. Hensley
Jeffrey L. Sheasley

Patricia M. Sobota
Assistant Editors

Lewis B. Nelson
Harold H. Shepard
Consulting Editors

Harold Rogers
Western Editor
Sausalito, CA 94965

Eleanor D. Weil
Art Director

Albert Zilenziger
Executive Vice-President, Director of Advertising

Glenn F. Schwaller
Marketing Manager

Caryn G. Gural
Production Manager

Carol Madison
Production Assistant

Phillip E. Jeanot
Circulation Manager

ADVERTISING OFFICES Chicago, IL 60630

Wayne P. Larsen
5235 North Elston Ave., Suite 2D
312-282-0909

Memphis, TN 38117

James M. Wolf
4646 Poplar Ave. #320
901-761-9333

Closter, NJ 07624

Galen B. Smith
317 Harrington Ave.
201-768-1164

Sausalito, CA 94965

Gary T. Fitzgerald
300 Valley St., Suite 302
415-332-5006

MEMBER BUSINESS PUBLICATIONS AUDIT

The national business magazine for the fertilizer and pesticide industries, FARM CHEMICALS serves primarily manufacturers, formulators, mixers, dealers, and commercial applicators of fertilizers and pesticides, reaching those persons responsible for management, marketing, and production. Subscription rates are in the U.S., its possessions, \$16.00, in other countries, \$20.00. Established in 1894 as THE AMERICAN FERTILIZER and incorporating CROPLIFE and AG CHEM & COMMERCIAL FERTILIZER.

Farm Chemicals (USPS 995-020)

Published monthly by
Meister Publishing Co.
37841 Euclid Avenue
Willoughby, Ohio 44094
216-942-2000

Controlled circulation postage paid at New Richmond, Wis.

Regional editions of this issue contain additional pages numbered 48 A1-A2, 56 A1-A2, 56 B1-B2 and 88 A1-A4. They appear following Pages 48, 56 and 88.

Postmaster: Please send change of address "Form 3579" to FARM CHEMICALS, Willoughby, Ohio 44094.

FARM CHEMICALS

Vol. 144 No. 3 March 1981

CROPLIFE and AG CHEM & COMMERCIAL FERTILIZER

- 13 The DuPont Agrichemicals Story
- 41 Soon It's Gonna Rain
- 66 A Barn-Burning Fertilizer Year
- 81 12.6-13.8 Million Tons N
- 102 How's Your Adjuvant I.Q.?

AG CHEM DEALER/APPLICATOR

- 49 "A Good Flagman Is Worth His Weight in Gold"
- 52 It Smells But It Sells
- 60 The Incredible Bulk
- 75 Big Plans for a Big Plane
- 82 National Custom Applicators Exposition
- 92 Avoid That Costly Down Time
- 97 TOK—Down But Not Out!

DEPARTMENTS

- 6 Calendar
- 10 Government and Your Business
- 110 Introducing the Profit Boosters
- 121 Meetings and Associations
- 131 Presstime News Report
- 134 What's Doing in the Industry
- 140 People
- 144 Editorial: "Is Doomsday Decision-Making Really Dead?"

THE COVER STORY

Although DuPont is known as a company with a broad line of pesticides, a large share of its most notable successes have been in herbicides. A good example is its new sulfonyl urea weed killer "Glean" which is targeted for wheat. Little wonder for DuPont's record in herbicides, however, when you realize that the company's vice president and head of the biochemicals department was the first to receive a PhD degree in weed control. Dr. Dale E. Wolf also wrote one of the original texts on the subject. The DuPont Agrichemicals story starts on page 13.

A Barn-Burning Fertilizer Year!

That's what industry leaders were predicting as TFI held its annual conference. Will consumption really reach 56.5 million tons? It may all depend on the weather—and the transportation system.

IT was downright cold, with temperatures hovering below zero and sharp winds coming off Lake Michigan—just the kind of weather fertilizer people have come to expect when The Fertilizer Institute holds its annual meeting each year in Chicago in February. Still, the sun shone brightly, reflecting the mood of the some 1100 industry leaders who crowded the lobby and corridors of the Hyatt Regency.

Almost without exception, they're looking for 1980-81 to be a barn-burning year despite drought conditions in some major cropping areas. TFI President Ed Wheeler, who has held steadfastly to his projection of 55 million tons, confidently predicted

use could soar to 56.5 million tons if weather conditions improve.

In fact, the worry isn't so much over sales but how to get the product to market. With the Mississippi River dropping almost daily, there is grave concern about barge movement of fertilizer materials. It's going to be a rail movement year, complicated by the reluctance of some dealers to fill up early because of high interest rates. In his "state of the union" address, Wheeler warned that "Placing a booming load of orders on the railroads without much prior notice could well lead to chaos. This is the single greatest concern we all ought to have. We can't do anything about the weather. We can do a great deal about

transport if we act now—today. I urge all of you to give this matter your greatest and immediate personal concern."

Then Wheeler shifted to rising costs, noting that "energy, transportation, and plant maintenance costs in particular have continued their relentless advance." Be candid with your customers, he urged, adding in a stern voice, "We cannot escape these cost increases any more than farmers can. At the same time, we must not use increased costs as a disguise or pretext to gouge them."

What is likely to happen to nitrogen and phosphate prices over the next four years was explored by L. L. Jaquier, head of W. R. Grace & Co.'s Ag-

L. L. Jaquier of W. R. Grace & Co. had his audience buzzing as he made these projections on prices for nitrogen and phosphates in '85.

OUTLOOK FOR 1985

HIGHER PHOSPHATE COSTS

Diammonium Phosphate (DAP)
Production - Central Florida

	1980	1985 (Proj.)	Inc/(Dec) \$/Unit %	
Price of Sulfur (\$/L Ton, FOB Tampa, Fla)	\$118	\$188(??)	\$70	59%
Fixed Capital Cost New Plant - (\$/Ann Ton DAP) (a)	\$244	\$386	\$142	58%
Cost of DAP (\$/S Ton)				
Sulfur	\$50	\$80	\$30	60%
Phosphate Rock (b)	23-33	40-47	17-14	74-42
Ammonia (b)	13-39	70-123	57-84	438-215
Processing	47-58	63-80	16-22	34-38
Total	\$133-\$180	\$253-\$330	\$120-\$150	90%-83%

(a) Facilities for sulfuric acid, phosphoric acid and DAP production. Phosphate rock, ammonia and sulfur excluded.

(b) Phosphate rock and ammonia charged at cost; no provision for return on investment.

ARE THESE COST INCREASES AFFORDABLE?

	1980 (Est Avg)	1985 (Proj.)	Inc/(Dec) 1980-1985
Cost of Natural Gas - (\$/Mcf)	\$2.10	\$6.00-\$12.00	\$3.90-\$9.90/Mcf
Cost of Ammonia (\$/S Ton)			
- At Plant	\$109	\$270-\$500	\$161-\$391/Ton
- To Farmers (Spring)	232	425-665	193-433/Ton
Cost of DAP (\$/S Ton)			
- At Plant	\$156	\$253-\$330	\$97-\$174/Ton
- To Farmers (Spring)	298	470-545	172-247/Ton

ARE THESE COST INCREASES AFFORDABLE?

	1980	1980	1985 Low High		Potential Cost Increase 1980-1985 Due to N and P ₂ O ₅ Fertilizers Low High	
Farm Price of Corn (\$/Bu) (a)	\$3.43	40¢	65¢	89¢	25¢	49¢
Retail Price of Choice Beef (\$/Lb)	\$2.38	4¢	7¢	10¢	3¢	6¢
Retail Price of Pork (\$/Lb)	\$1.40	3¢	5¢	7¢	2¢	4¢

(a) Estimated average price U. S. farmers will receive for 1980 corn crop.

ricultural Chemicals Group.

Jaquier projects increase in nitrogen consumption for the current fertilizer year from 2 to 7%, with phosphate increases from 4 to 8%, based on higher crop prices and more acres planted to corn and wheat, with cotton and soybean acreage at 1980 levels or slightly below.

It was the projections for 1985 that had everyone buzzing. Jaquier looks for cost of producing a ton of phosphate rock in Central Florida to increase 77 to 95% over the next four years, while cost of a ton of diamon-

ium phosphate delivered to the farm gate will jump from an estimated average price of \$298 in 1980 to \$470-\$545. Cost of a ton of ammonia, he projects will go from an estimated average price of \$232 last spring to \$435-\$665—an increase of \$193 to \$433/ton! (See accompanying tables on page 66.)

"Prices are going to be a real shock," Jaquier noted in an understatement. "Will we be priced out of the market? I don't think so."

To back up his evaluation, the W. R. Grace executive cited the following

figures: "In 1980, corn was selling at an average price of \$3.43/bushel. It cost 40 cents per bushel for the nitrogen and phosphate used. In 1985, the same amount of nitrogen and phosphate would cost 65 to 89 cents/bushel. To offset the higher priced fertilizers, the retail price of beef would have to go up 3 to 6 cents, the retail price of pork, just 2 to 4 cents.

"In 1980, 16.2% of U.S. disposable personal income was spent on food," he noted. "The potential increases due to increased prices of nitrogen and phosphate fertilizer would be 0.1 to 0.3% of the disposable personal income."

CLARK PROFIT SYSTEM

A plan for greener profits.



The Clark Lawn Pro.

Quality that gives you an extra return without an expensive extra investment. That's what the Clark Profit System is all about. Lawn Pro turns equipment you already own into a profit-plus home lawn care center for NPK application, foliar feeding, broadleaf control, pest control and tree spraying. You get a standard pickup field sprayer plus hose reel with 250 feet of hose and electric takeup, specialized lawn booms and a high pressure pump. All you need is a pickup, fertilizer and chemicals, your manpower and experience, and you're ready to

enter today's growing market in professional lawn care.

Quality that gives you an extra return on an investment you've already made. That's what the Clark Profit System is about. Find out today how the Clark Profit System can work for you.



Lely Independence Manufacturing Co.
Independence, MO 64050
(816) 796-6550

Growth through applied innovation.

For Details Circle No. 126 on Postcard

Analyzing the Rail Situation

At a special seminar for retailers held during the TFI meeting, Thomas J. Regan, vice-president of corporate traffic and distribution for International Minerals & Chemical Corp., discussed the rail deregulation act and its ramifications.

Looking at quantity and quality aspects, Regan noted that quantity of rail service will probably be less, but quality is going to improve. "I personally feel that this will improve. Some of the factors indicating this are: (1) The railroads in the past three years have increased their rail fleet significantly, especially covered hoppers; (2) in addition to increasing their rail car fleet, they have increased the power units in their systems; and (3) they are definitely concentrating on high density line movements.

"In addition, there is a brand new aspect available to both the shipper and the railroad for developing satisfactory service. The new law permits the railroad and a shipper to enter into a contract—one in which not only the rate but the service requirements can be detailed. Let's face it, in order to get the attention of the railroad with regard to a contract arrangement, you must have a competitive or alternative system which could be used to take the tonnage off the rails. After all, why should they listen to you and bind themselves to a lower rate and more stringent service conditions—or both—if they are not threatened with the loss of revenue through removal of the tonnage," he noted frankly. "Nevertheless, this avenue is available for establishing satisfactory service to those shippers who can make use of it."

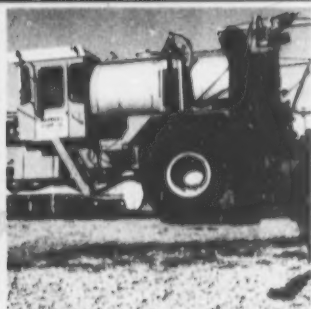
Regan told the retailers that the type of service that will be disappearing are the low density lines—lines that carry less than 1 million ton miles of traffic per mile of line per year. "These are lines associated with service to small country elevators, small manufacturing locations, and the like," he noted.

Summing up, Regan told the retailers that:

- Rail rates are going to be higher in

Now . . . A Big Foam
Marker for the Big Iron
from Richway

New GX-1 Foam Marker!



Richway's Totally New GX-1 Foam Marking System, especially designed for the large floaters, is making **Big News** in the industry. The elimination of all filters and screens will all but eliminate most maintenance and down time. The system includes a large 31 gallon capacity, heavy polyethylene tank that absolutely won't rust . . . a "first" with pressure tank foam systems. The side switching valve has no moving parts, exposed to foam, and is easily controlled from a cab-mounted switch-box. You have a choice of pneumatic or electric side switching valve. Adjust air volume at the switchbox to easily regulate drop frequency of large balls of foam from 30 to 300' apart. If your customers insist on accuracy and you want to save time and labor costs, rely on RICHWAY . . . the only full line marker manufacturer in the business.

Call Toll Free Right Now For All The Facts!
Phone 1-800-553-2476
In Iowa Phone 1-319-987-2976



**Richway
Industries Ltd.**

Box 508, Jonesville, Iowa 50647 Phone 319-987-2976

For Details Circle No. 128 on Postcard

the future, particularly for the bulk shipper.

- There will be increasing use of contracts of affreightment with the railroads, and, as a result, the amount of information available concerning freight rates will be "drastically reduced."

- There will be a drastic reduction in the light density rail lines.

"If you suspect your operation is a possible candidate for abandonment—start planning your course of action now," Regan advised.

A Strong Call for More Research

Senator Thad Cochran (R-MS), who is chairman of the subcommittee on production, marketing, and price stabilization of the Senate Agriculture Committee and head of the agricultural appropriations subcommittee of the Appropriations Committee, gave TFI members some insight on what to expect from the Senate, where Republicans are in the majority for the first time in over 25 years.

Cochran looks for an extremely busy session "since the 1977 Farm Act expires this fall and we must renew or rewrite an omnibus farm bill." He told TFI members that he has already met with Agriculture Secretary John Block and is interested in working to promote and expand American farm exports.

He also voiced support for "continuing sound agricultural research and development programs that have helped make American agriculture the most productive in the world. We're on the brink of a decade of unparalleled growth but we could lose the opportunity if we're not careful."

Cutting back on agricultural research would have an adverse impact on our ability to produce, he warned, adding that there are "better ways of dealing with insects, diseases, we can sharpen our fertilizer recommendations, improve our methodology." He urged the private sector to develop a partnership with the universities and the government to further research.

Giusti Elected Chairman

New chairman of the board of TFI is Dr. Gino P. Giusti, president of Texasgulf. Vice-chairman is Judson H. Drewry, president of the fertilizer group and senior vice-president of International Minerals & Chemical Corp. Ed Wheeler was re-elected Institute president.

Others elected to the executive committee were: D. William Calvert, Agrico Chemical Co.; Richard H. Matzke, Chevron Chemical Co.; Dan C. Hutson, Hutson Co., Inc.; David E. Steger, Agrichem Inc.; and Frank C. Miller, Willmar Manufacturing. Tom C. Parry, of Mississippi Chemical Corp., immediate past board chairman, serves as ex officio member. **FC**

FARM CHEMICALS

AUGUST • 1981

9/1/81 C 5950-1

NATIONAL

C O M

A P

R S

EXPO



September 9-10
Stockton, Iowa

WASHINGTON DC 20014
4520 E-W HWY STE 800
STATISTICAL REF INDEX
001
P 01810584 69

BEST AVAILABLE COPY

Richard T. Meister
President and Editorial Director

Gordon L. Berg
Editor

Charlotte Sine
Managing Editor

Sophie Meister
Associate Editor

Shirley I. Hensley
Jeffrey L. Sheasley

Patricia M. Sobota
Assistant Editors

Lewis B. Nelson
Harold H. Shepard
Consulting Editors

Harold Rogers
Western Editor
Sausalito, CA 94965

Eleanor D. Weil
Art Director

Albert Zilenziger
Executive Vice-President, Director of Advertising

Glenn F. Schwaller
Marketing Manager

Caryn G. Acuff
Production Manager

Carol Madison
Production Assistant

Phillip E. Jeanot
Circulation Manager

ADVERTISING OFFICES

Chicago, IL 60630

Wayne P. Larsen
5235 North Elston Ave., Suite 2D
312-282-0909

Memphis, TN 38117
Gary Myers

4646 Poplar Ave. #320
901-761-9333

Closter, NJ 07624

Galen B. Smith
317 Harrington Ave.
201-769-1164

Sausalito, CA 94965

Gary T. Fitzgerald
300 Valley St., Suite 302
415-332-5006

MEMBER BUSINESS PUBLICATIONS AUDIT

The national business magazine for the fertilizer and pesticide industries, FARM CHEMICALS serves primarily manufacturers, formulators, mixers, dealers, and commercial applicators of fertilizers and pesticides, reaching those persons responsible for management, marketing, and production. Subscription rates are: in the U.S., its possessions, \$16.00; in other countries, \$20.00. Established in 1894 as THE AMERICAN FERTILIZER and incorporating CROPLIFE and AG CHEM & COMMERCIAL FERTILIZER.

Farm Chemicals (USPS 995-020)

Published monthly by
Meister Publishing Co.
37841 Euclid Avenue
Willoughby, Ohio 44094
216-942-2000

Controlled circulation postage paid at New Richmond, Wis.

Regional editions of this issue contain additional pages numbered 18A1-A2. They follow Page 18.

Postmaster: Please send change of address "Form 3579" to FARM CHEMICALS, Willoughby, Ohio 44094.

FARM CHEMICALS

Volume 144 No. 8 August 1981

CROPLIFE and AG CHEM & COMMERCIAL FERTILIZER

18 Chalk Up A Victory

29 Congress Takes Another Look at FIFRA

135 I Strongly Believe *Nicholas L. Reding*

146 Bioengineering: Scientific Fact or Fancy?

156 Weather/Chemicals Allied in 'Hopper War

158 Gypsy Moth—Agriculture's Next Victory?

NATIONAL CUSTOM APPLICATORS' EXPOSITION

14 Expo Program

16 Expo Committee

42 On Display at Expo

AG CHEM DEALER/APPLICATOR

22 Creative Financing Can Help You

32 Birth of a Blender

36 Conduct Your Own Fly-In

40 Introducing the Air-Flow Boom

105 An Acre and a Half of Independence

136 Dealing with Drift

NATIONAL APPLICATORS' EQUIPMENT & SUPPLY GUIDE

108 Supply Guide

118 Company Addresses

DEPARTMENTS

6 Check These Dates

10 Government and Your Business

138 Presstime News Report

140 What's Doing in the Industry

144 People

148 Meetings and Associations

160 FC Executive Suite

166 Editorial: "Thank You, Jerry Brown"

Conduct Your Own Fly-In

A visual pattern assessment test may not be the most accurate test available but it will allow you to check your pattern frequently and to make the correct adjustments.

By DENNIS K. KUHLMAN

SIGNIFICANT strides have been made during the past few years in the improvement of aerial application equipment, formulations and techniques for the safe use of pesticides. This has resulted in reduced damage claims from losses of materials outside designated target areas, as well as providing greater safety for mixers,

Mr. Kuhlman is assistant professor in the Department of Agricultural Engineering, Kansas State University. This article was excerpted from a talk on Fly-In Technology for Agricultural Aircraft presented at the National Agricultural Aviation Association annual meeting in December.

loaders, and pilots involved in pesticide use. However, little has been done to improve the pilots understanding of his aircraft and dispersal systems. It is the pilot's responsibility to properly set-up his aircraft for his individual requirements.

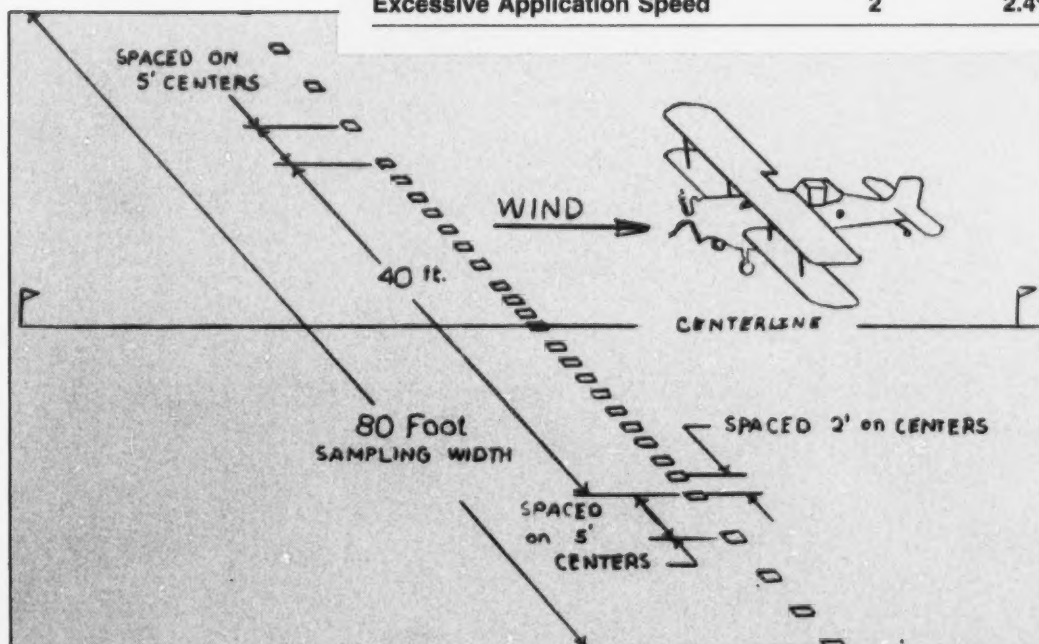
During 1980, eighty-four aircraft in six states were "patterned" to deter-

mine their spray distributions. Table 1 indicates the areas and frequency of problems found with these aircraft during the fly-in clinics. It should be noted that many aircraft had multiple problems.

Fly-in techniques vary greatly from location to location. However, until recently, at best they were crude ap-

Table 1. 1980 Aircraft Pattern Results (84 Total Aircraft)

Problem	Number	Percent
No improvement made	4	4.8%
Spray System Leaks (Total)	25	29.8%
Diaphragms	14	16.7%
Pump Seals	5	5.9%
Connectors	9	10.7%
Extremely Worn Nozzle Tips	60	71.4%
Propwash	26	30.9%
Overcompensation for Propwash	25	29.8%
Plugged Nozzles	23	27.4%
Wingtip Vortex	62	73.8%
Excessive Application Speed	2	2.4%



proximations with little scientific background. The visual pattern assessment and similar methods were and are the best available for an individual applicator who does not have the opportunity to use more scientific procedures.

The visual pattern method is quick and requires no complicated equipment. This visual analysis allows the pilot to check his pattern frequently and to adjust his equipment quickly for a particular application. Approximately 30 minutes is required.

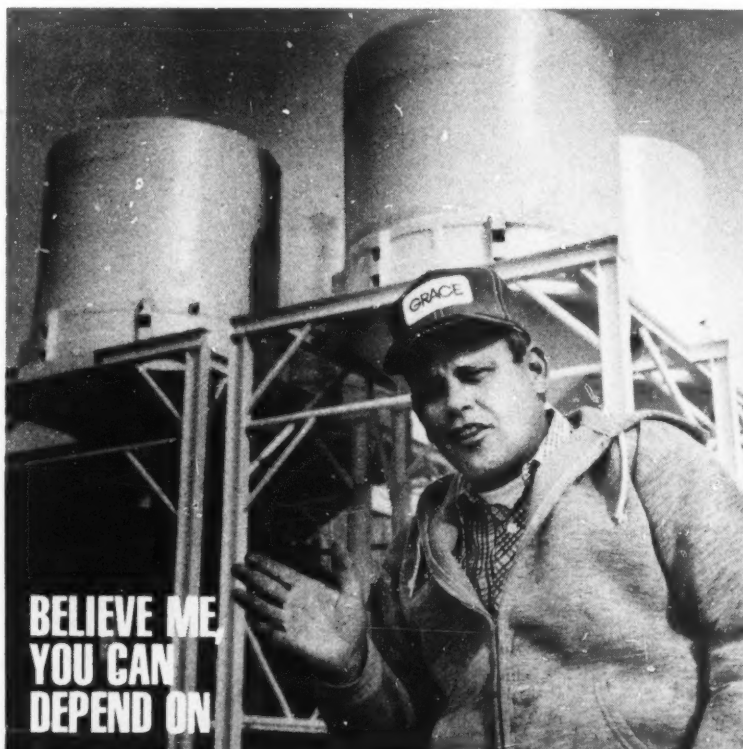
Swath pattern testing should dupli-

cate the field situation in terms of aircraft spray height, airspeed, power settings, spray pressure, and nozzle locations. The best time for testing is early in the morning before the sun heats the ground and causes thermal turbulence. The plane should always be flown directly into the wind and testing should be limited to days when the wind speed is less than 10 MPH.

The general test layout is shown in Figure 1. The sample line can be individual sheets of paper or adding machine paper spread out in a continuous line. The length of the sample

line should be a minimum of 80 feet. Before testing the aircraft make sure that all nozzles, screens, boom, etc., are clean and rinsed. Put about 30 gallons of water into the spray hopper and add enough water soluble dye to make a dark solution. Fly a short pass (or spray on ground to purge booms) and check for leaks around individual nozzles and pump area. The dye will make any leaks or plugged drop pipes easy to spot. Determine the wind direction and align flags as indicated in Figure 1 about 100 yards on each side of the sample line.

After aircraft takeoff, purge the spray



PALMER TANKS

"We've bought a lot of Palmer tanks over the past fifteen years and this year we're buying more. We're sold on the quality Palmer puts into every tank. Most of all, we're impressed with their outstanding service. If we ever need help we know Palmer will be there, and in our business that means a lot."

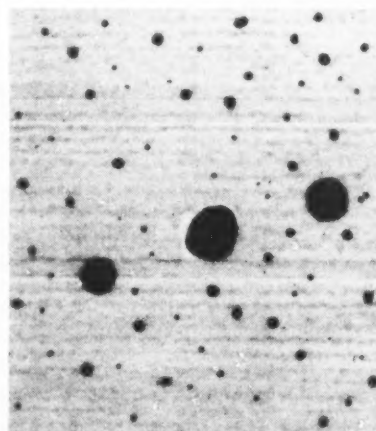
Take it from Bill Jobe, manager of the Copeland outlet of Collingwood Grain, Inc. For the finest in quality and service you can depend on Palmer.

Wide variety • Fiberglass or steel

Kansas 316-275-7461
Out of State 1-800-835-9136

Hwy. 50 W P.O. Box 1195
Garden City, Kansas 67846

Hwy 385 P.O. Box 1089
Andrews, Texas 79714



Large droplets resulting from pump leak.

lines making sure that dye leaves the end nozzles. Align the aircraft with the flags on a spray run that duplicates actual field practices. Have the spray on at least 100 yards on both sides of the sample line while maintaining straight and level flight to assure a representative pattern. It is a good idea to remove the paper and repeat this test to make sure that the run was representative of typical spray deposition.

Visual evaluation requires some experience but common problems with spray uniformity and swath width can be determined. Scan the entire sample line looking primarily for uniformity of deposition. Dark dye is much easier to evaluate than a diluted dye. Things to watch for include light drop density areas around the centerline and uneven densities toward the wingtips. The effective swath width will be considerably narrower than the distance between the outside samples where dye is evident.

Gradual dye level reduction at the pattern edges is ideal as this allows for swath overlap. But the only way to get the proper overlap is to locate the point where the dye density is about one-half of that found toward the center of the pattern. The distance between these one-half density points on each wing will be the effective swath width.

FC

For Details Circle No. 119 on Postcard

FARM CHEMICALS

C5950-1

Seventh International
Plant Protection Issue

Protecting the
20 Crops That Stand
Between Man and Starvation

NACA Annual Meeting
Sept. 27-30
The Greenbrier

WASHINGTON DC * 20014
4520 E-M HWY STE 800
STATISTICAL REF INDEX
001
60
P 01810584

Richard T. Meister
President and Editorial Director

Gordon L. Berg

Editor

Charlotte Sine

Managing Editor

Sophie Meister

Associate Editor

Shirley I. Hensley

Jeffrey L. Sheasley

Patricia M. Sobota

Assistant Editors

Lewis B. Nelson

Harold H. Shepard

Consulting Editors

Harold Rogers

Western Editor

Sausalito, CA 94965

Eleanor D. Weil

Art Director

Albert Zilenziger

Executive Vice-President, Director of Advertising

Glenn F. Schwaller

Marketing Manager

Caryn G. Acuff

Production Manager

Carol Madison

Production Assistant

Phillip E. Jeanot

Circulation Manager

ADVERTISING OFFICES

Chicago, IL 60630

Wayne P. Larsen

5235 North Elston Ave., Suite 2D
312-282-0909

Memphis, TN 38117

Gary Myers

4646 Poplar Ave. #320

901-761-9333

Closter, NJ 07624

Galen B. Smith

317 Harrington Ave.

201-768-1164

Sausalito, CA 94965

Gary T. Fitzgerald

300 Valley St. Suite 302

415-332-5006

MEMBER BUSINESS PUBLICATIONS AUDIT

The national business magazine for the fertilizer and pesticide industries, FARM CHEMICALS serves primarily manufacturers, formulators, mixers, dealers, and commercial applicators of fertilizers and pesticides, reaching those persons responsible for management, marketing, and production. Subscription rates are: in the U.S., its possessions, \$16.00; in other countries, \$20.00. Established in 1894 as THE AMERICAN FERTILIZER and incorporating CROPLIFE and AG CHEM & COMMERCIAL FERTILIZER.

Farm Chemicals (USPS 995-020)

Published monthly by
Meister Publishing Co.
37841 Euclid Avenue
Willoughby, Ohio 44094
216-942-2000

Controlled circulation postage paid at New Richmond, Wis.

Regional editions of this issue contain additional pages numbered 72A1-A2 and 80 A1-A40. They follow Page 72 and Page 80.

Postmaster: Please send change of address "For 3579" to FARM CHEMICALS, Willoughby, Ohio 44094.

FARM CHEMICALS

Vol. 144 No. 9 September 1981

CROPLIFE and AG CHEM & COMMERCIAL FERTILIZER

- 13 Protecting the 20 Crops that Stand Between Man and Starvation
- 14 A Framework for Food and Agricultural Policy for the 1980 John A. Schnittker
- 17 The 20 Crops That Stand Between Man and Starvation Sylvan H. Wittwer
- 55 A Look At World Pesticide Markets
- 65 Has Agricultural Technology Reached the Point of Diminishing Returns?
- 72 What Kind of Bug Year Has It Been?
- 73 Rhone-Poulenc Gets Its "Definite Expansion" in the U.S.
- 75 An Interview with Anwar Sadat
- 81 Improving Patent Protection
- 86 An Interview with Nick Reding
- 102 Calendar of International Plant Protection Meetings

SPECIAL REPORT ON JAPAN

- 32 Japanese Pesticide Producers Are Driven by Lure of New Markets
- 37 All Eyes Are On Kumiai
- 40 Nippon Soda Looks to Soybeans
- 41 Mitsubishi Sets Sights on Life Science Chemistry
- 42 Nippon Kayaku Grows With Diazinon
- 43 Hokko Says It Has "The Technique"
- 44 Nihon Nohyaku Increases Export Sales
- 45 Takeda Banks on Antibiotics
- 46 Sumitomo: Still the Leader
- 49 Nissan: A Future Contender for Herbicides
- 51 Society of Agricultural Chemicals
- 52 Sogo Shosha Builds Agrichemical Markets

DEPARTMENTS

- 6 Check These Dates
- 10 Government and Your Business
- 122 Presstime News Report
- 124 What's Doing in the Industry
- 126 People
- 130 Editorial: "Science vs. 'Cornucopia' "

The Cover Story

The crop protection chemicals industry plays a vital role in helping to protect rice and the 19 other crops that stand between man and starvation. But research must continue to find new methods of control and to improve the productivity of agriculture worldwide. In this special issue, FC focuses on changes being proposed in U.S. pesticide registration and patent laws that could have tremendous impact on future development. Cover photo by Dr. Sylvan H. Wittwer

BEST AVAILABLE COPY

FARM CHEMICALS

THE 20 CROPS THAT STAND BETWEEN MAN AND STARVATION

Looking for target crops in your research programs? These crops are the major markets of today—and of the future.

By SYLVAN H. WITTWER

PLANTS provide directly or indirectly up to 95% of the world's food supply. Thus, any reserve technologies which may be called up to insure future food supplies must reside in improved crop production. Of the 350,000 species of plants on earth only about 0.1%, or less than 300, are currently used worldwide for food.

Globally, 20 plants essentially stand between the world's people and starvation. They are wheat, rice, corn, potatoes, barley, sweet potatoes, cassava, soybeans, oats, sorghum, millet, sugarcane, sugar beets, rye, peanuts, field beans, chick peas, pigeon peas, bananas, and coconuts. The cereal grains alone (wheat, rice, corn, barley, oats, rye, sorghum, millet) provide over 60% of the calories and 50% of the protein consumed on the earth.

Any new technologies for increasing production should not ignore these

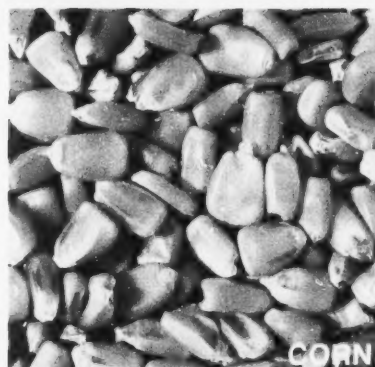
**Wheat
Rice
Corn
Potatoes
Barley
Sweet Potatoes
Cassava
Soybeans
Oats
Sorghum
Millet
Sugar Cane
Sugar Beets
Rye
Peanuts
Field Beans
Chick Peas
Pigeon Peas
Bananas
Coconuts**



One of agriculture's strongest and most articulate spokesmen, Dr. Wittwer is director of the Michigan Agricultural Experiment Station and assistant dean of Michigan State University's College of Agriculture. He is a frequent member of food production fact-finding missions sponsored by the Overseas Development Corp., and has participated in the World Task Force on Food sponsored by the Kettering Foundation and the USSR to improve cooperation in solving global problems.



SOYBEANS



CORN



SORGHUM



OATS



PEANUTS

crops. The international agricultural research centers have assembled large numbers of accessions (varieties and cultivars) of the major food crops. This includes 40,000 for rice, 26,000 for wheat, 13,000 for corn, 15,000 for sorghum, and 5500 for pearl millet. Included also are 12,000 for potatoes, 2000 for cassava, 11,300 for chick peas, 6000 for pigeon peas, and 21,000 for field beans with 7000 for peanuts (2).

Annual losses from pests as shown in Table 1 are enormous (4). A reduction in these losses could result in significant increases in food for people without bringing any new land into production. Pests continue to cause farm production losses in the U.S. equal to 30% of the sales value.

All major crops suffer losses before harvest that exceed 20%. The range, persistence, and severity of pests in the tropics and subtropics are more extreme than they are in temperate zones and less is known about them (Table II). It is still not possible to grow wheat in the lowland tropics primarily because of pest problems.

Increased use of integrated pest management practices should reduce the amounts of pesticides applied per acre of cropland, but total pesticide use will increase. It is projected that the total use of all chemicals in agriculture will rise during the next 20-50 years. Otherwise, it will not be possible to meet the increasing demands of rising populations and the desire for improved diets. The impact of increased use of chemicals in agriculture will have a growing effect in the environment. This will be especially so if aerial applications of pesticides increase (7).

Have Altered Course of History

Pests have been a major factor in causing instability and risk in crop production and even have altered the

TABLE I. Losses From Pests and Potential Benefits From Control (4)

Crops	Percent of Loss	20% of Current Loss Presented (million tons)	Millions Fed Each Year Calories and/or Protein
Rice	46	56	177
Wheat	24	23	82
Corn	35	31	121
Millet/Sorghum	36	11	44
Potatoes	32	30	25
Cassava	34	11	16
Sweet Potato	26	9	12
Soybeans	29	5	86
Peanuts	40	2	21
Bananas	31	—	—

TABLE II. Number of Crop Diseases in Temperate and Tropical Regions

Crop	Temperate	Tropics
Rice	54	500-600
Corn	85	125
Beans	52	250-280

course of history. In each instance one of the 20 crops that protect the world from starvation was afflicted.

The great potato famine from late blight *Phytophthora infestans* in Ireland in the mid-1800s resulted in a loss of 2.5 million people by starvation and migration. There were wheatless days in 1917 in the U.S. from stem rust epidemics on wheat. The great Bengal famine of 1943 was associated with *Helminthosporium* brown spot on rice. All Victoria-derived oats were afflicted in the mid-1940s by a fungus causing the Victoria blight. A warm

moist summer in 1970 brought on the southern corn leaf blight and the loss of one-seventh of America's number one crop for that year. From 1974 to 1976 there was a shift in brown planthopper biotypes that afflicted large acres in the Philippines and Indonesia planted to a few semi-dwarf strains of rice, and in India in 1973 there was a downy mildew epidemic in pearl millet (5).

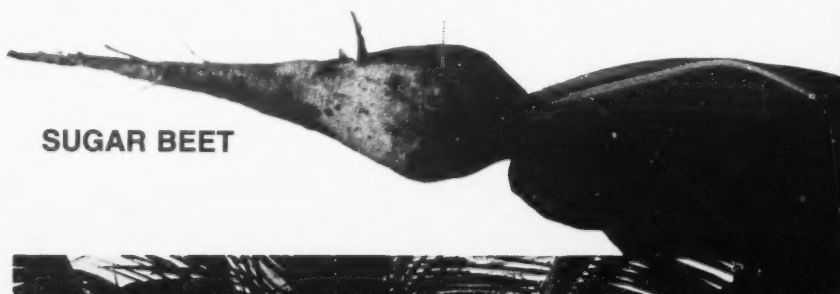
Chemicals will play an increasingly important role in protecting the world's 20 critical crops from pests.

Corn. The United States produces over 50% of the world's supply (3). Corn production in the U.S. represents a unique package of plant protection technology. There is almost universal use of fungicidal and insecticidal seed protectants for control of seed corn maggots and other insects and seed decay. These seed treatments result in stability of production. They enable early precision planting without reduction of stands for high yielding early hybrids (1).

Pesticides are used for the control of cutworms, stem borers, earworms, and rootworms. Insecticides are banded on the soil over the row at planting time or aerially applied to kill adult beetles. Leaf blights, stem



SUGAR CANE



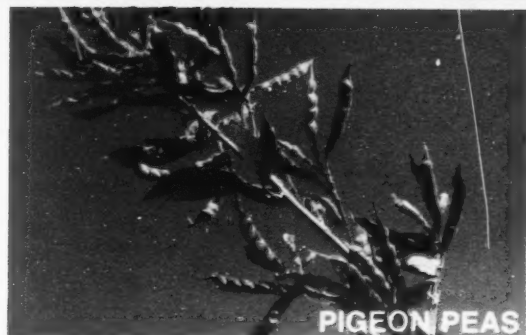
SUGAR BEET



COCONUTS



BARLEY



rots, streak virus, and stunt may seriously impair yields if not controlled. Downy mildew is the most serious disease in the tropics. Seventy-nine percent of the corn planted in the U.S. is treated with herbicides making up 45% of the total herbicide usage in the nation (Table III).

Potatoes. Potatoes are the world's fourth most important food crop. There was a remarkable jump forward in production from 1940 to 1950 whereby yields more than doubled in one decade. New chemicals originating from World War II technology became available and for the first time it became possible to control flea beetles and leafhoppers. Meanwhile, great progress has been made in the chemical control of late blight, early blight, seed piece decay, and nematodes.

Much of the progress in potato production since 1940 has occurred as a result of more timely and effective use of pesticides. Fifty-seven percent of

the acres used for potato production in the U.S. are treated with herbicides, and insecticides and fungicides are used on 77% and 49% of the crop, respectively (Table III).

Rice. More people in the tropics and subtropics look to rice as their mainstay than any other crop. China is the No. 1 producer of rice with 35% of the total crop, and India is No. 2 with 22% (3).

Paddy rice is the world's most extensively irrigated crop. It may be grown on the same area year after year. Weeds are controlled by purposeful flooding. Without fertilizers and pesticides, yields were approximately 1.5 metric tons per hectare. Yields much greater than this are now achieved with new genetically improved varieties and with fertilizers and pesticides.

The use of pesticide chemicals pays off as new varieties and fertilizers are introduced. The ultimate will be insect and disease resistant varieties. Devastating insects include the brown planthopper, stem borers, leaf hoppers, Gall midge, and whorl maggot. Blast is the most important fungus disease. It is now partially under control for lowland rice in Asia, but is still a major threat for upland rice in Africa. Other diseases are bacterial blight, tungro, and grassy stunt.

The use of selective herbicides is essential for direct seeded rice in the U.S., France, Italy, Colombia, Vene-

zuela, and Brazil. Ninety-two percent of all U.S. rice is treated with herbicides (Table III).

Wheat. The USSR is the world's leading producer of wheat with 27% of the total, followed by the U.S. with 11% and China with 10%. There is no effective means of controlling weeds other than through the use of selective herbicides. Globally, about 200 million acres of wheat are sprayed annually with selective herbicides with yield increases resulting therefrom of 10 to 20%. Thirty-eight percent of the wheat acreage in the U.S. is herbicide treated. There are, in addition, many insects and fungus diseases that afflict wheat.

Multilines have now been developed for rust resistance, and these resistant varieties coupled with cultural practices and biological controls show great promise for the future. It is now becoming possible to select effectively for resistance to insect and diseases in the cereal grains.

Other Crops. Serious pest problems exist with others of the 20 crops that protect the world from starvation. Grain sorghum seeds are usually treated with a protectant to prevent decay. Greenbugs, shoot flies, stem borers, and midge have to be controlled. Barley is afflicted with rust, powdery mildew, virus stripe, and leaf spot.

Soybeans, while relatively free of diseases and insects in the northern

corn belt of the U.S., are subject to many disease and insect problems in the South and in the Mississippi Delta. Eighty-eight percent of the U.S. soybean acreage is treated with herbicides and 8% with insecticides.

Peanuts in the U.S. are troubled with rusts, leaf spots, mottle, rosette, stunt, and spotted wilt. Seventy-six percent of the crop is treated with fungicides, 55% with insecticides, and 93% of the acreage with herbicides (Table III).

Large quantities of fungicides are used on bananas and there are also bacterial wilts. Nematodes are serious in coconuts. The Porroca disease killed hundreds of thousands of the palms in South America. Little is known of pests that attack coconuts and even less about their control.

Wilts and blights afflict chick peas and pigeon peas. There are about 200 insect pests on pigeon peas, the most serious being borers and pod flies. Field beans are infested with mosaic virus, rust, anthracnose, angular leaf virus, bacterial blights, and aphids with problems much greater in the tropics than in temperate zones (Table II).

Cassava has problems of mosaic, bacterial blights, anthracnose, phoma leaf spot, root rots, mealy bugs, white fly, green and red spider mites, and thrips. Sweet potatoes are afflicted

TABLE III. Pesticide Usage in the U.S. (Percent Treated—1976)*

Crop	Herbicide	Insecticide	Fungicide
Corn	79	38	1
Wheat	38	14	1
Soybeans	88	8	3
Rice	92	11	0
Potatoes	57	77	49
Dry Beans	90	—	—
Peanuts	93	55	76

*Data derived from: Eichers, T.R., P.A. Andrienas, and T.W. Anderson, 1978. *Farmer's Use of Pesticides in 1978*. USDA Agricultural Economic Report No. 418; and Pimental, D. et al, 1978. *Benefits and Costs of Pesticide Use in U.S. Food Production*. Bioscience 28:772, 778-784.

with virus, weevils, aphids, and white flies. Sugar beet production has been discontinued in many former producing areas of the western U.S. because of nematodes and *Rhizoctonia* (black rot) root rots which pose a continuing problem.

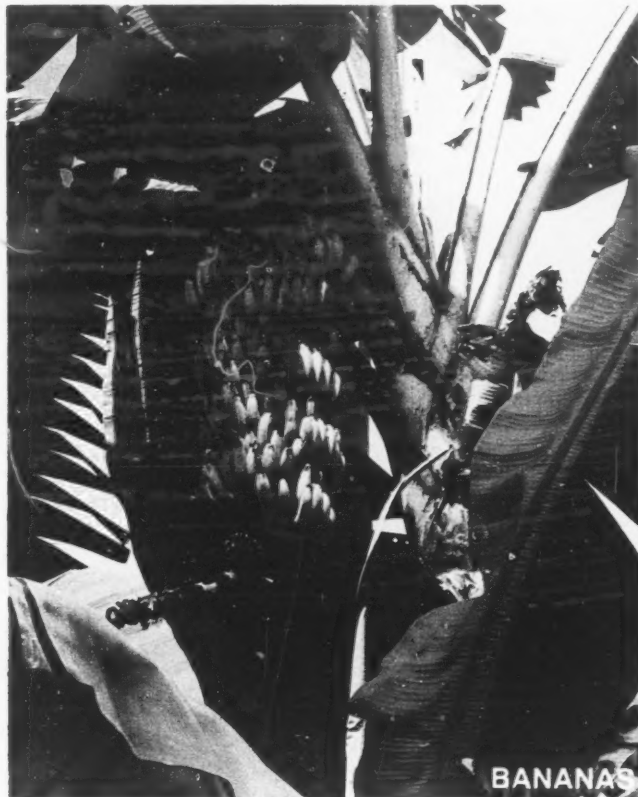
Battle Not Over

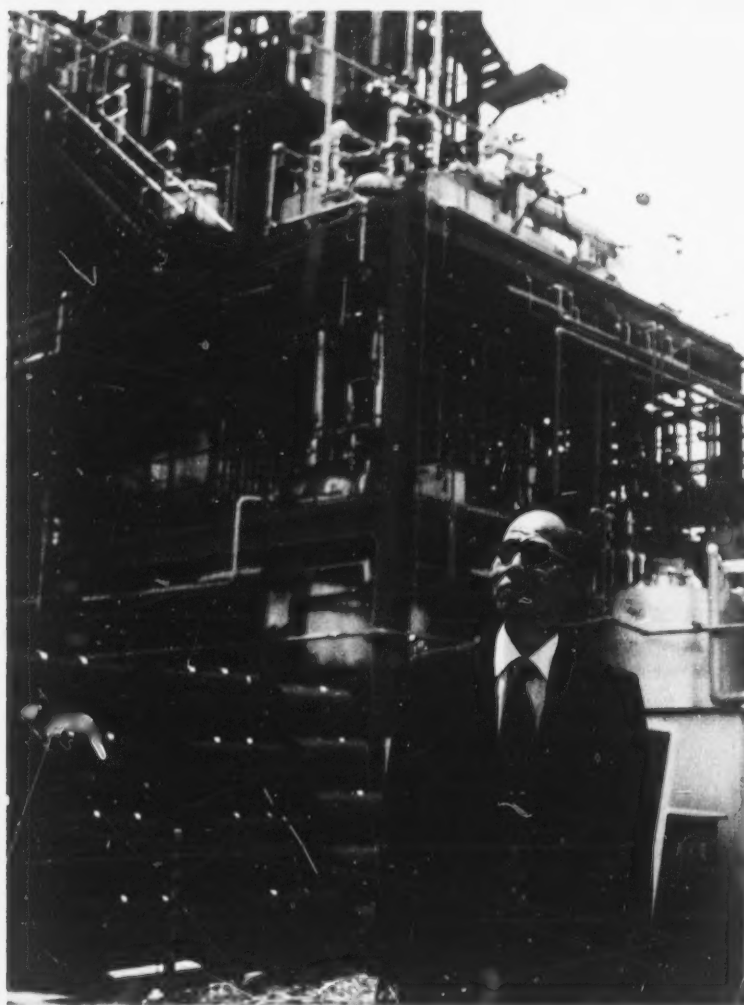
The battle has not been won and will go on in protecting the 20 crops, and a few others, that feed the world. There are now available many lines of

attack: Development of resistant varieties; cultural practices; biological controls; and chemicals. Chemical usage will increase but will be better targeted and timed. Otherwise, maximum production from our limited land and water resources would not be possible. Increased productivity of food is absolutely essential if we are to meet the needs of rising world populations, establish strategic food reserves, and satisfy the desire of all nations for more improved and abundant diets.

FC

Photos by Sylvan H. Wittwer





Shiro Mochizuki, president, Kumiai Chemical Industry Co., Ltd.

JAPAN

*"We're making up for lost time
with herbicides"*

FC Special Report

Japanese pesticide producers are driven by lure of new markets

Having been successful in developing insecticides and fungicides for other markets these innovative companies are now concentrating on herbicides for U.S. corn, cotton, soybean, wheat, and rice markets.

"WE are driven!" That's the catchy Datsun commercial that has caught the attention of automobile lovers for several years. But what about Japan's pesticide producers—are they driven by the same forces that propelled Datsun, Toyota, Nissan, Mitsubishi, and other Japanese auto makers to the top?

The answer that FC editors received to that question on a recent trip to Japan is that what drives their agricultural chemical divisions is the same deep respect for technology that all their industries share—with the added incentive of getting into the U.S. cotton, corn, soybean, wheat, and rice markets with new herbicides.

As one spokesman for the industry put it, "We've been slow recognizing the need for herbicides because it was just natural that we would solve our insect and disease problems first. But now the emphasis is on herbicides."

And that's what appears to be taking place as Kumiai, Nippon Soda, Nissan, and Ishihara Sangyo Kaisha all have exciting herbicide entries close to registration or under test in the U.S. Sumitomo claims to be close to developing one, too.

This is the way to the top, all right, but it will "be awhile" before you see a Japanese pesticide company in the

"top 10 world pesticide marketers," in spite of their amazing achievements—such as Sumitomo's development of what some experts say is the best pyrethroid in the market. What's preventing Japanese companies from entering these major world markets in the same way as Bayer, Ciba-Geigy, and other huge companies have done?

To answer that question, you must understand how Japan looks at the market.

One "Japan-watcher" told FC, "They have a different approach to marketing. Sometimes they seem to be extremely conservative, but the truth is they are very patient people. They're willing to wait..."

Hideo Mori, general manager of Sumitomo's Agricultural Chemical Division, doesn't get excited about the "rating game" anyway. "It is difficult to 'rate' a company in the world market if its sales are based on technical material such as ours are. Project those figures to the value of formulated products and they're more than double," he said.

Historically, Japan has been hesitant about establishing agrichemical subsidiaries overseas because of the success of their trading companies, sogo shosha, in introducing their products over the world. As Mori

said, "Sumitomo Soji operates in 136 countries compared to Sumitomo Chemical's 80 countries."

The profit margins over the years have been termed "extraordinary" for Japanese pesticide divisions in some markets. However, increasing costs of developing new compounds and stricter government regulations will bring about some changes in marketing of pesticides in the future. Sumitomo, for example, is attempting to gain experience in pesticide formulation through a new partnership with a company called Yamamoto Noh-yaku Co.

Another fact about the Japanese pesticide industry is that it isn't entirely made up of large companies. An organization that is not a household word outside Japan but which just might beat them all in the race to enter the "charmed circle" of world pesticide leaders is Kumiai Chemical Industry Co., Ltd.

The leader in domestic pesticide sales, Kumiai has caught the attention of the pesticide world because of its impressive research capability. The company merged its research and development with Ihara Chemical Industry Co., Ltd. The latter has always had a close working relationship with Kumiai and is known for its manufac-



turing prowess as well as its successful synthesis effort over the years.

"It's always been hard to tell the two companies apart," one pesticide expert told FC. "They seemed like one and the same."

Kumiai has become a major factor in the international market with Saturn herbicide—called Bolero in the U.S. Kumiai and its licensee, Chevron, are eagerly awaiting an EPA registration for use of Bolero on rice.

Although the Japanese pesticide industry is dominated by giant corporations which are involved in everything from automobiles to pesticides, S. Mochizuki, president of Kumiai, is not convinced that this necessarily gives them an edge in world pesticide marketing.

"Development of pesticides is a far more complex field than, say, auto production," he said. "It isn't easy satisfying the Ministry of Agriculture, Forestry and Fisheries."

With the increasing use of pesticides in Japan the past two decades came concern about environmental pollution, residual toxicity, and accidental poisonings. Starting in 1955 parathion was gradually replaced by new organophosphorus insecticides, and its use was prohibited in 1971. Organomercuric fungicides were

banned in 1968 and replaced by non-mercuric chemicals and antibiotics.

It is expected that the production and marketing of aldrin, dieldrin, and endrin insecticides for purposes other than research will be banned this fall. Companies in Japan ceased manufacturing these products in the early 1970s when their use in agriculture was banned. Japanese insecticide formulators for industrial and home markets have been importing these products, but this will cease with the anticipated ban.

It is expected that DDT will meet the same fate. Its use in agriculture was banned 10 years ago.

In the 1980 pesticide year ending September 30, production and deliveries of pesticides totalled about \$1.5 billion (based on ¥220 per U.S. \$1). Imports totalled about \$240 million and exports about \$259 million.

Why have Japanese pesticide companies been so successful recently in the development of new pesticides, especially herbicides? Talk to any U.S. pesticide executive who has visited a Japanese company and he'll tell you that it's because of the national obsession with science! There's even a new city in Ibaraki Prefecture devoted entirely to science. It's called Tsukuba Science and Education City.

Almost unknown outside Japan, it's a new municipal complex of research laboratories and educational facilities. Tsukuba grew out of radical thinking about future directions of Japan and the need for revolutionary ideas.

The Ministry of Agriculture, Forestry and Fisheries, which has almost 30 research institutes—among them the prestigious National Institute of Agricultural Sciences—was recently moved to Tsukuba Science and Education City.

It has often been said that what is making the Japanese move so fast technologically is their emphasis on consensus, an assumed cooperative relationship between the various branches of government rather than the adversary approach which has permeated the U.S. system.

This spirit carries over into agricultural chemicals R & D.

"Japanese pesticide companies literally 'swarm' over specific problems with teams of technical specialists," FC was told. "It's unbelievable how many well trained people they can bring to bear on a problem that is holding up progress."

Sumitomo is a good example of this. As a result, it has been the leader in international development of pes-

ticides among the nation's pesticide producers. In fact, it is the only company whose international sales exceed domestic sales.

"Hopefully, we'll remain No. 1," Mori said. "We've doubled our pesticide sales since 1975. However, this has been technical, not formulated, products."

Sumitomo scientists spent more than 30 years developing their pyrethroid insecticide. Sumicidin is their top product and they feel that it will continue to be the "No. 1 pyrethroid" for many years. In the U.S. where the product is known as Pydrin, Shell Chemical is building its own new "multi-million pound" Mobile, AL plant.

The Japanese pesticide industry is one of marked contrasts. Nissan Chemical Industries, Ltd. has not had a proprietary it could call its own, but

it's taken dead aim on the U.S. cotton and soybeans markets with a new herbicide that has grabbed the attention of weed control experts. Referred to as NCI-96683, the compound is receiving preliminary evaluation as a selective, postemergence herbicide. In addition to possible introduction in the U.S. soybean and cotton markets, the company is hopeful that it will become a "leading contender" in the European sugar beet market.

Nissan racked up big sales with such products as Elsan, EPN, Swep, 2,4-D, and MCP and ranks as one of the leading exporters in the industry. Elsan is marketed in Southeast Asia, especially Korea and Indonesia, and the Middle East (including Iran and Iraq). The U.S. cotton market is the main target for EPN, and Nissan is also promoting its use in Latin American countries.

Nippon Soda also has been making news this past year as Topsin-M (thiophanate-methyl) has had a major expansion of its label in the U.S. EPA has granted Nippon Soda's licensee, Pennwalt Corp., registrations for use of the product on soybeans. The company's venture with BASF seems destined to pay off, too. This involves Poast (NP55), a new postemergence grass herbicide for which BASF is attempting to obtain an EPA registration in cotton, soybeans, alfalfa, and vegetable crops. This compound belongs to the same group as aloxymid sodium (NP48 Na) which is being marketed under such trade names as Kusagard and Fervin (Schering AG).

Takeda is Nippon's largest pharmaceutical firm and some experts say it is "Japan's agrochemical leader of the future." This is because of a strong research base which includes com-

Photo by Sylvan H. Wittwer



Deliveries of Pesticides (In ¥ million)

	1979		1980	
	Production	Delivery	Production	Delivery
Insecticides ...	113,837(38.9%)	107,889(37.7%)	130,678(39.6%)	122,886(38.7%)
Fungicides	76,662(26.2%)	74,504(26.1%)	88,677(26.9%)	87,628(27.6%)
Insecticide- Fungicides ..	19,474(6.7%)	18,924(6.6%)	22,910(6.9%)	22,111(7.0%)
Herbicides ...	76,424(26.1%)	78,552(29.5%)	80,234(24.3%)	77,600(24.5%)
Rodenticides ..	812(0.3%)	779(0.3%)	677(0.2%)	683(0.2%)
Adjuvants	1,605(0.6%)	1,567(0.6%)	1,900(0.5%)	1,891(0.6%)
Plant Growth Regulators ..	3,537(1.2%)	2,950(1.0%)	2,502(0.9%)	2,495(0.8%)
Others	660(0.2%)	969(0.2%)	2,409(0.7%)	2,000(0.6%)
Total	293,011	286,167	329,987	317,294

Trend of Pesticide Import (In ¥ million CIF)

	1979	1980
Technical Grade	24,637	39,294
Preparations	9,703	13,343
Pesticides for Tests	15	—
Total	34,356	52,637

Trend of Pesticide Export (In ¥ million FOB)

	1979	1980
Technical Grade	24,829	41,970
Intermediate		
Preparation (Insecticides)	1,974	4,137
Preparation (Fungicides)	4,108	2,961
Preparation (Herbicides)	5,829	8,114
Preparation (Others)	292	101
Total	37,032	57,283

pounds that perform differently than conventional chemicals. Padan insecticide, based on a naturally-occurring substance, nereistoxin, has been widely used for its broad spectrum control of insects, and Validacin, an antibiotic fungicide, is being used in many parts of the world against sheath blight in rice and black scurf of potatoes.

Recently, Takeda developed a new insecticide, TI-78, for use against Colorado potato beetle in the European market and vegetable and fruit insects in Japan.

There are other pesticide companies which are making excellent progress in developing new herbicide compounds. One is Ishihara Sangyo Kaisha which has a joint effort with ICI in the development of fluazifop-butyl as an herbicide. ICI reports that their product Fusilade is a systemic herbicide that offers excellent control of annual and perennial grasses. These include seedling johnsongrass, barnyardgrass, crabgrass, panicums (Texas and fall), broadleaf signalgrass, fox-tails, wild oats, itchgrass, shattercane, wild proso millet, and volunteer corn. Rhizome johnsongrass is also highly susceptible, as are quackgrass and bermudagrass. A research program with independent cooperators is currently being conducted on soybeans and cotton in the U.S.

Mitsui Toatsu has also been increasing its activities in agrichemical research and development. They have a new herbicide for use in rice paddy fields called Uribest. The company has manufactured such pesticides as MCPA, lindane, chloropicrin, and quintozone.

What's happening in the exciting field of genetic engineering in which Japan is reportedly a leader? Sumitomo's T. Yamamoto, deputy general manager and associate to the board, looks at this as a field in which their pesticide researchers "should be able to make a large contribution." At their Institute of Biological Sciences, "gene splicing" is a separate research area. Yamamoto told FC, "We regard this as a field which should not be limited to pharmaceuticals."

FC learned that other companies were also committed to this field of research. Mitsubishi has a 100% owned basic research organization called Mitsubishi-Kasei Institute of Life Sciences which conducts basic research in "life sciences." Started in 1971, the institute is highly involved in molecular breeding, or so-called genetic manipulation, which studies, among other things, the propagation of nitrogen-fixing bacteria, blue-green algae, and even new plants.

Japan's pesticide achievements are particularly amazing when you con-

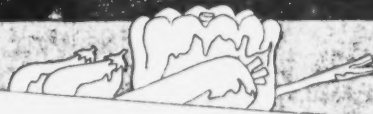
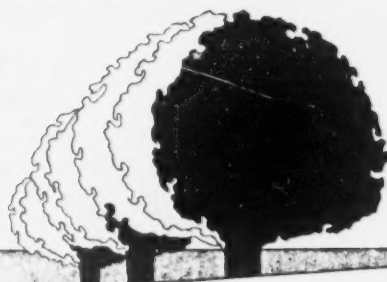
sider the restrictions that are placed on its industry. Take land, for example. Sumitomo literally ran out of space at its Osaka headquarters, built its new Takarazuka Research Center on the outskirts of the city, and continues to spread out in outlying areas. Aerial application of pesticides is being conducted solely by helicopter because of a shortage of landing space and obstacles around the fields. It wasn't until 1958 that the first large-scale application of pesticides by helicopter was carried out on rice fields to control blast disease.

As the acreage of rice fields sprayed from the air expanded, the Agricultural Aviation Association was established in 1962 to set up operations to investigate techniques and apparatus and to provide courses for pilots.

Little wonder that Japan is looking at new approaches to international marketing of its growing pesticide product line, whether it be more partnerships, subsidiary companies, or whatever. One thing is sure, problems will continue to be effectively solved through the spirit of consensus. Nothing detracts these companies from their goal.

Right now their goal is to get into the lucrative U.S. cotton, corn, soybean, rice, and wheat markets. And it appears that they've succeeded in establishing a beachhead. **FC**

Mitsui Agricultural Chemicals Serving Agriculture



MO[®]

HERBICIDE

Granule 9%

Emulsifiable concentrate 20%

OFUNACK[®]

INSECTICIDE

Emulsifiable concentrate 40%

Wettable powder 50%

Dust 2%

MITSUI TOATSU

MITSUI TOATSU CHEMICALS, INC.

Agricultural Chemicals & Pharmaceuticals Division

2-5, Kasumigaseki 3-chome, Chiyoda-ku, Tokyo, Japan

Cable: "MITSUITOATSU TOKYO" Telex: Call No. 0222-3622 Answer Back Code (MTCHEM J)

A Look At World Pesticide Markets

Here's an exclusive look at U.S. and world markets for crop protection chemicals by crop, type of pesticide, and area of the world.

HOW did last year's sales stack up, and what are you predicting for next year? What is your 5-year forecast? That's what FC recently asked leading international marketers of crop protection chemicals in a confidential survey.

Their answers reflect continued optimism about the future use of agrochemicals. The respondents pegged 1980 sales worldwide at \$11.5 billion (in US 1980 dollars) and look for an increase of \$1.1 billion in sales next year. Looking ahead to 1985, they project sales will top \$14.3 billion.

The U.S. continues to be the largest single market (and surprisingly, the market most frequently named where the biggest increase in use will occur over the next 5 years), with sales estimated at \$3.5 billion at the user's level in 1980. By 1985, they look for U.S. sales to exceed \$4.4 billion. Big increases are also projected for Brazil, the People's Republic of China, Mexico, and Japan.

There are factors that could limit pesticide use, however. Cited by the respondents most often were depressed commodity prices, low investment resources in developing countries, government regulations, and trade barriers and other restrictions placed on imports.

Still, two-thirds of the respondents reported that their R&D efforts are expanding, and over half expect to continue to expand their research efforts over the next five years. About one-third of the respondents have broadened their research programs to include genetic engineering and biologicals, as well as naturally occurring insecticides and fungicides.

On the following pages, average figures are presented for 1980 by crop and by U.S., Western Europe, Japan and the Far East, rest of the world, and total world.

The figures represent the best thinking of the leading international marketers. **FC**

Table 1
HOW THE MARKET DIVIDES¹
(User's Level)
(Millions of U.S. 1980 Dollars)

World (including U.S.)

Pesticide	1980	1982	1985
Herbicides	4,891	5,307	6,022
Insecticides	3,916	4,228	4,764
Fungicides	2,199	2,417	2,772
Other ²	559	654	758
TOTAL	11,565	12,606	14,316

United States

Pesticide	1980	1982	1985
Herbicides	2,171	2,418	2,760
Insecticides	908	1,013	1,128
Fungicides	226	240	276
Other ²	199	248	319
TOTAL	3,504	3,919	4,483

¹Estimated

²Includes soil fumigants; defoliants and desiccants; plant growth regulators; pheromones; attractants and viruses; and rodenticides.

Source: FARM CHEMICALS

A Look At World Pesticide Markets

Table 2
THE HERBICIDE
MARKET BY CROP—
1980¹
(User's Level)
(Millions of U.S. 1980 Dollars)

Crop	U.S.	Western Europe	Japan & Far East	Rest of World	Total
Corn	754	99	14	210	1,077
Cotton	142	6	13	160	321
Wheat	97	377	29	119	622
Sorghum	59	8	2	14	83
Rice	53	21	285	70	429
Other Grains	29	204	9	37	279
Soybeans	749	17	22	125	913
Tobacco	17	3	4	8	32
Peanuts & (Groundnuts)	31	—	5	10	46
Sugar Beets	26	200	6	42	274
Sugarcane	14	—	14	72	100
Coffee	—	—	6	18	24
Cocoa	—	—	—	10	10
Tea	—	—	9	14	23
Rubber	—	—	42	10	52
Other Field Crops ...	29	24	19	20	92
Alfalfa	16	15	1	4	36
Other Hay & Forage .	9	4	1	1	15
Pasture & Rangeland	30	12	10	26	78
Fruits, Vegetables & Horticultural Crops ..	116	169	37	63	385
Fruits and Nuts ...	(56)	(82)	(17)	(27)	(182)
Potatoes & Vegetables	(60)	(87)	(20)	(36)	(203)
Total	2,171	1,158	528	1,034	4,891

¹Estimated
Source: FARM CHEMICALS

Crop	U.S.	Western Europe	Japan & Far East	Rest of World	Total
Corn	242	57	29	90	418
Cotton	212	27	140	539	918
Wheat	13	21	10	32	76
Sorghum	21	6	7	34	68
Rice	11	8	428	116	563
Other Grains	7	14	5	9	35
Soybeans	33	5	13	78	129
Tobacco	24	8	13	38	83
Peanuts (Groundnuts)	18	1	20	29	68
Sugar Beets	8	49	7	28	92
Sugarcane	5	—	10	29	44
Coffee	—	—	4	39	43
Cocoa	—	—	13	26	39
Tea	—	—	31	22	53
Rubber	—	—	13	11	24
Other Field Crops ...	20	24	22	32	98
Alfalfa	23	10	2	5	40
Other Hay & Forage .	4	4	2	9	19
Pasture & Rangeland	5	3	2	8	18
Fruits, Vegetables & Horticultural Crops ..	262	269	254	303	1,088
Fruits & Nuts	(155)	(192)	(138)	(175)	(660)
Potatoes & Vegetables	(107)	(77)	(116)	(128)	(428)
Total	908	506	1025	1477	3916

¹Estimated
Source: FARM CHEMICALS

Table 3
THE INSECTICIDE
MARKET BY CROP—
1980¹
(User's Level)
(Millions of U.S. 1980 Dollars)

A Look At World Pesticide Markets

THE BIG FIVE SINGLE CROP MARKETS IN 1980¹ (User's Level)

(Millions of U.S. 1980 Dollars)

No. 1—CORN	
Herbicides	\$1,077
Insecticides	418
Fungicides	21
Total	\$1,516

No. 2—RICE	
Herbicides	\$ 429
Insecticides	563
Fungicides	308
Total	\$1,300

No. 3—COTTON	
Herbicides	\$ 321
Insecticides	918
Fungicides	27
Total	\$1,266

No. 4—SOYBEANS	
Herbicides	\$ 913
Insecticides	129
Fungicides	31
Total	\$1,073

No. 5—WHEAT	
Herbicides	\$ 823
Insecticides	76
Fungicides	272
Total	\$ 970

Table 4
THE FUNGICIDE MARKET BY CROP—
1980¹
(User's Level)
(Millions of U.S. 1980 Dollars)

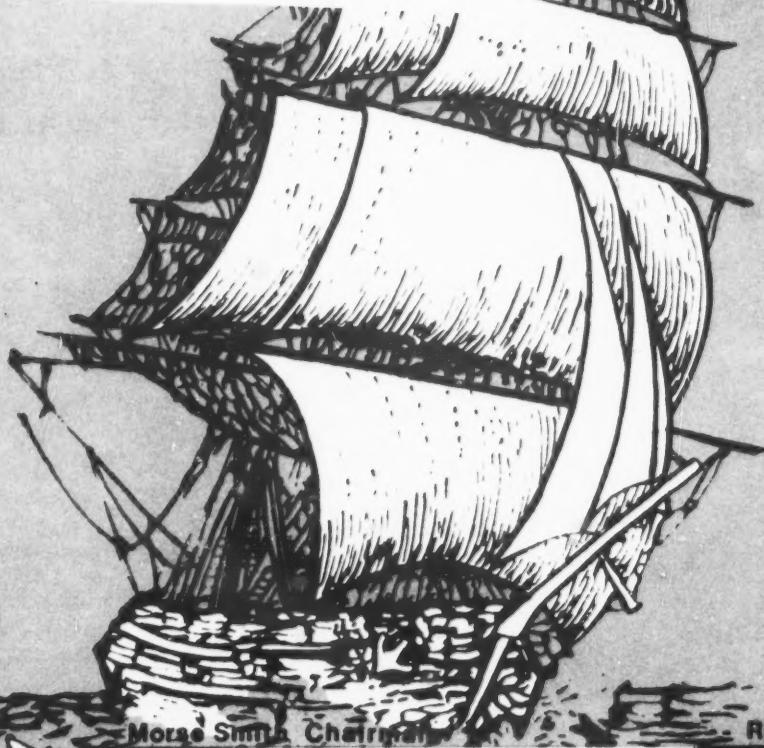
Crop	U.S.	Western Europe	Japan & Far East	Rest of World	Total
Corn	6	4	3	8	21
Cotton	12	1	4	10	27
Wheat	7	185	5	75	272
Sorghum	2	3	3	6	14
Rice	5	3	249	51	308
Other Grains	5	76	6	20	107
Soybeans	17	1	5	8	31
Tobacco	3	4	10	12	29
Peanuts (Groundnuts)	34	—	6	8	48
Sugar Beets	5	10	6	13	34
Sugarcane	3	—	4	23	30
Coffee	—	—	6	47	53
Cocoa	—	—	3	11	14
Tea	—	—	12	4	16
Rubber	—	—	11	4	15
Other Field Crops ...	3	7	3	6	19
Alfalfa	3	3	—	6	12
Other Hay & Forage .	1	1	2	3	7
Pasture & Rangeland	1	—	1	1	3
Fruits, Vegetables & Horticultural Crops ..	119	562	179	279	1,139
Fruits & Nuts	(81)	(443)	(101)	(175)	(800)
Potatoes & Vegetables	(38)	(119)	(78)	(104)	(339)
Total	226	860	521	595	2,199

¹Estimated

Source: FARM CHEMICALS

OCTOBER • 1981

FARM CHEMICALS



H. J. BAKER & BRO.
130 Years a
Fertilizer
Trader

Morse Smith, Chairman

Rutger Smith, President



WASHINGTON DC 20014
4520 E-W HWY STE 800
STATISTICAL REF INDEX
001
60
P 01810584

BEST AVAILABLE COPY

Richard T. Meister
President and Editorial Director

Gordon L. Berg
Editor

Charlotte Sine
Managing Editor

Sophie Meister
Associate Editor

Shirley I. Hensley

Jeffrey L. Sheasley

Patricia M. Sobota
Assistant Editors

Lewis B. Nelson

Harold H. Shepard
Consulting Editors

Harold Rogers
Western Editor
Sausalito, CA 94965

Eleanor D. Weil
Art Director

Albert Zilerziger
Executive Vice-President, Director of Advertising

Glenn F. Schwaller
Marketing Manager

Caryn G. Acuff
Production Manager

Carol Madison
Production Assistant

Phillip E. Jeanot
Circulation Manager

ADVERTISING OFFICES

Chicago, IL 60630

Wayne P. Larsen
5235 North Elston Ave., Suite 2D
312-282-0909

Memphis, TN 38117

Gary Myers
4646 Poplar Ave. #320
901-761-9333

Closter, NJ 07624

Galen B. Smith
317 Harrington Ave.
201-768-1164

Sausalito, CA 94965

Gary T. Fitzgerald
300 Valley St., Suite 302
415-332-5006

MEMBER BUSINESS PUBLICATIONS AUDIT

The national business magazine for the fertilizer and pesticide industries, FARM CHEMICALS serves primarily manufacturers, formulators, mixers, dealers, and commercial applicators of fertilizers and pesticides, reaching those persons responsible for management, marketing, and production. Subscription rates are: in the U.S., its possessions, \$16.00; in other countries, \$20.00. Established in 1894 as THE AMERICAN FERTILIZER and incorporating CROPLIFE and AG CHEM & COMMERCIAL FERTILIZER.

Farm Chemicals (USPS 995-020)

Published monthly by
Meister Publishing Co.
37841 Euclid Avenue
Willoughby, Ohio 44094
216-942-2000

Second class postage paid at Willoughby, Ohio 44094
and additional mailing offices:

Postmaster: Please send change of address "For
3579" to FARM CHEMICALS, Willoughby, Ohio 44094

FARM CHEMICALS

Volume 144 No. 10 October 1981

CROPLIFE and AG CHEM & COMMERCIAL FERTILIZER

13 H. J. Baker & Bro., Inc.: "We Believe in Creative Selling"

23 Bioengineering: Scientific Fact or Fancy—Part 2

49 The Media and Medfly

52 Introducing BFC Chemicals

58 It's Prime Time for Agriculture

83 Ag Research: Everyone Who Eats Benefits

98 Get Ready for the Fertilizer Industry Roundtable

AG-CHEM DEALER/APPLICATOR

42 Your Pesticide Warehouse is Burning!

62 Do You Really Know Your Fertilizers? Part 6—Potash
Lewis B. Nelson

68 Chemigation: Coming On Strong

86 An Investment in Customer Service

90 Infrared Photography: Crop Management Tool of the Future

DEPARTMENT

6 Check These Dates

10 Government and Your Business

73 Introducing the Profit Boosters

88 Book Reviews

100 Meetings and Associations

106 Presstime News Report

108 What's Doing in the Industry

112 People

118 Editorial: "The Morning After"

THE COVER STORY

The clipper ship forms an important part of the history of one of the fertilizer industry's pioneering companies. It was a clipper that carried Henry J. Baker from Baltimore to Manhattan where he started H. J. Baker & Bro., Inc., becoming one of the earliest traders of fertilizers and manufacturer of organics such as castor pomace and bird guano. Many of the materials arrived from around the world by clipper ship. Today H. J. Baker is one of the industry's leading trading companies. For the complete story of the company headed by Morse Smith and his brother Rutger, see the article beginning on page 13.

BEST AVAILABLE COPY

FARM CHEMICALS

Chem Systems Predicts Phos Acid Trade Increase

PROGNOSTICATORS at Chem Systems Inc. say phosphate fertilizer trade will increase 9% per year during the '80s to exceed 10 million metric tons annually by 1990. Other key findings in their recently published projection of phosphate business include world phosphate fertilizer consumption continuing to grow almost 5% annually with phosphoric acid growth at 6%, higher because of the trend toward use of higher analysis products.

"North America and Africa," the study continues, "will continue as the major phosphate exporters. The free economy countries of Asia will remain the leading importing group but will be challenged by the communist countries including Eastern Europe, USSR, and the Peoples Republic of China. A strong dependency on non-communist countries by this group for phosphate supplies will result if expected consumption is realized."

Although many technological improvements have occurred, the study doubts that "revolutionary breakthroughs" are likely during the decade. Efficiency and environmental acceptability of phosphoric acid

manufacture will continue to improve, but investment in such activities as recovering uranium from phosphoric acid will remain questionable for some time.

Wide price fluctuations are predicted for the short term with phosphate remaining the "most price elastic of the major fertilizer nutrients." However, pressure caused by market and economic forces will act to "underpin strong pricing" for phosphoric

acid and phosphate fertilizers due to upward spiraling raw materials prices (especially sulfur) and processing costs for acid manufacture.

The report, *The Future Phosphoric Acid Business* (2 volumes, 772 pages), is available from either of its joint publishers—Chem Systems Inc., 14925 Memorial Dr., Houston, TX 77079; and Chem Systems International Ltd., 28 St. James's Sq., London SW1Y 4JH, England.

WORLD PHOSPHATE FERTILIZER CONSUMPTION

(Million metric tons P_2O_5)

	1978/79	1984/85	1989/90	Annual Growth (Percent)
North America	6.2	7.1	8.1	2-3
South America	1.8	3.4	5.1	10
Western Europe	5.8	6.6	7.1	2
Eastern Europe	7.9	10.6	13.6	5
Middle East	0.9	1.2	1.7	6
Africa	0.8	1.2	1.6	6
Asia (Free Economy)	2.7	4.3	5.7	7
Asia (Communist)	2.1	3.3	4.6	7-8
Oceania	1.1	1.6	1.9	5
Total	29.3	39.3	49.4	5

Acid Rain Targeted for CAST Study

HORROR stories abound concerning rainfall with the same pH as vinegar falling on fields and cities, and people look with distaste and dread toward their industrialized neighbors upwind. But is acid rain, as the phenomenon has come to be known, a new problem, and is it entirely without redeeming quality?

The Council for Agricultural Science and Technology (CAST) has appointed a task force to look into the subject in depth, and a full report will be forthcoming. CAST emphasizes, however, that this is not the first study group to tackle the subject: "Farmers were contending with soils that had become acid from natural causes associated with precipitation long before the industrial revolution and the dawn of scientific agriculture. Agricultural scientists have studied the nature, causes, effects, and correction of soil acidity for well over half a century, and much has been learned that is now largely overlooked in the educational information being released."

To satisfy interests while research is being conducted and assembled, CAST has released what it terms to be "a reasoned perspective based on facts." The source of this "pre-report" information is the American Society of Agronomy, Inc.

The agronomists summarized their

findings briefly: "(1) The sulfur and nitrogen in acid rain are plant nutrients; (2) soils and lakes become acid from natural causes as well as from acid rain; (3) the amount of acidity produced in agricultural soils by acid rain is small in relation to the acidity produced there by other causes; and (4) lakes that have become acid and fishless because of acid rain can be neutralized and made suitable for fish, should the presence of fish justify the investment."

Using the society's magazine (*Crops and Soils*, June-July 1981) as a forum, the agronomists pointed out that although sulfur deficiencies have been noted in 32 of the 50 states, none of these is in the Northeast, yet all the southeastern states report deficits. In fact, says the report, "Alabama has a law requiring that all mixed fertilizers sold in the state contain a minimum of 3% sulfur." It is assumed that the northern states receive concentrations of atmospheric sulfur that meet needs.

This sulfur is not unlike the sulfur supplied by fertilizers (nor is the atmospheric nitrogen markedly different from nitrogen in fertilizer, but it is available in smaller than needed amounts). It is, in fact, "utilized by plants as nutrients and of economic value if the amounts supplied are sufficient but not excessive."

G. L. Terman of The Sulphur Institute explains that to achieve moderate to high yields, crops need 8 to 85 pounds of sulfur per acre per year. This amount would fall in 22 to 234 inches of acid rain (pH 4.0) "such as that falling in the Adirondack region of New York." It would be sufficient, that is, if all the rain were sulfuric and if all the acidity were caused by sulfur.

J. C. Noggle, says the report, told the Tennessee Valley Authority in 1979 that acid rain is worth as much as \$20 per acre "on the basis of the crops it produces." And Dr. R. G. Hoeft and his colleagues found almost a decade ago that 44% of the sulfur present in alfalfa grown in a Wisconsin test greenhouse in acid-washed sand came from the atmosphere.

Atmospheric acid has been attributed to oxide emissions after 1960, but they cannot be the only causes of acid soils. A 1934 study (reconfirmed by a 1968 study) concluded that soils in dry regions tend to be neutral or alkaline while humid areas have acidic soils as the result of natural processes. R. Patrick mentioned in *Science* earlier this year that "naturally acid lakes and ponds have existed since the 1860s in New England and New Jersey, and similar shallow lakes and ponds occur also in the Southeast."